FARMING SYSTEMS IN THE SANDY AREA OF THE THUA THIEN HUE PROVINCE, CENTRAL VIETNAM. SURVEY OF SOCIO-ECONOMIC SITUATION AND CONSTRAINTS IDENTIFIED BY FARMERS

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SUMMARY

The Thua Thien Hue province situated in Central Vietnam encompasses 5,054 km^2 with a population of about 1.1 million people. The total cultivated area is 84,000 ha of which approximately 66,000 ha are soils classified as having a sandy texture. This sandy area is located along the coast and is the most densely populated of the province.The presented research aims at evaluating various aspects of the present situation including socio-economic aspects and farming systems on these light textured soils of this province. Using an interview-based questionnaire, a survey was conducted in villages by staff members of the Hue University of Agriculture and Forestry. Data were collected among 145 households in four districts of the coastal area of the Thua Thien Hue province. The results show that hostile climate, poor quality of soils, lacking of technical knowledge and experience in agricultural production of smallholders on sandy soils are major constraints that limit crop yields and induce a deficit in nutritive value of animal feed. Low income of farmer's households is an obvious consequence of this unfavorable situation. Our results also indicate that the present animal and cropping systems on sandy soils of Thua Thien Hue include a high diversity of local varieties of plants and local breeds of animals. Tracks for possible improvement of techniques will be suggested. This research is being conducted in the framework of a Vietnam-Belgium joint project towards a sustainable agricultural development in this area, mainly through the better use of organic resources within farming systems, and by integrated pest and disease management.

Key words: Sandy soil, households, smallholders, animal production, crop production, farming system

TÓM TẮT

Nghiên cứu này nhằm mục đích đánh giá thực trạng về tình hình Kinh tế- Xã hội và Hệ thống canh tác ở vùng đất cát. Một cuộc điều tra phỏng vấn do các cán bộ giáo viên trường Đại học Nông Lâm Huế tiến hành ở một số xã thuộc vùng đất cát tỉnh Thừa Thiên Huế. Kết quả điều tra cho thấy sự khắc nghiệt của khí hậu, đất nghèo dinh dưỡng, thiếu hiểu biết kỹ thuật và kinh nghiệm là những yếu tố chính làm hạn chế năng suất cây trồng và sự mất cân đối trong giá trị dinh dưỡng của thức ăn gia súc, trong sản xuất nông nghiệp nông hộ ở vùng đất cát. Thu nhập nông hộ thấp là hậu quả tất yếu của tình trạng này. Kết quả nghiên cứu của chúng tôi cũng cho thấy rằng hệ thống sản xuất trồng trọt và chăn nuôi hiện có là rất đa dạng về các giống cây trồng và vật nuôi. Nghiên cứu cũng nhằm mục đích tìm các giải pháp kỹ thuật đề xuất nhằm cải thiện tình hình sản xuất ở địa phương này. Nghiên cứu này trong khuôn khổ hoạt động của dự án liên kết giữa Việt Nam và Bỉ về sản xuất nông nghiệp bền vững ở vùng đất cát trên cơ sở khai thác sử dụng tốt hơn nguồn vật chất hữu cơ trong hệ thống canh tác và kết hợp với biện pháp quản lý và phòng trừ dịch bệnh gây hại nhằm tăng năng suất vật nuôi cây trồng.

INTRODUCTION

Sustainable agriculture is a subject of great interest and lively debate over years in many part of the world. According to Honeyman (1991), sustainable production is a combination of production techniques that enhance profit and improve the area's environmental and socio-economic condition.

Descriptive observation studies about smallholder have been conducted in Solomon Island (De Fredrick, 1977). Integrated, or mixed farming system, crop and livestock are interdependent elements (Amir and Knipscheer, 1989).

Vietnam is an agricultural country with over 80% population living in rural area and their livelihood is mainly based on agriculture. Similarly, in Thua Thien Hue province, farmers rely chiefly on farming production for their life while off-farm activities are hardly developed. Their life is still difficult and not easy to be changed. The situation is worse in sandy areas, where soil conditions are clearly not suitable for an efficient agriculture. Fortunately, local people own diverse resources of plant varieties and animals breed, which can be more efficient (thank to low inputs) and more sustainable (due to less chemical use) agriculture.

A detailed survey was conducted to identify potentials and constraints in farming systems of the coastal sandy area in Thua Thien Hue Province. This research should provide reliable information for identifying tracks for improving farming systems namely by optimizing organic matter recycling, which is a key problem in tropical light textured soils.

METHODS

Interviewee's selection

Interviewees (145 families) were selected from seven villages of the four coastal districts of Thua Thien Hue province (Phong Dien, Quang Dien, Phu Vang, and Phu Loc; see Figure 1), after allocating households into three income groups: rich, with income > 200,000 Vietnamese dông (VND), i.e. some 10 euros or 13 US$, per person and per month, average with income from 140,000 to 200,000 VND, and poor with income less than 140,000 VND. These groups of farmers were categorized by village or hamlet chairpersons, who could make the best income estimation of their villagers. To make sure that one interviewee correctly met the selection criterion, a double check for eligibility at start of an interview was done.

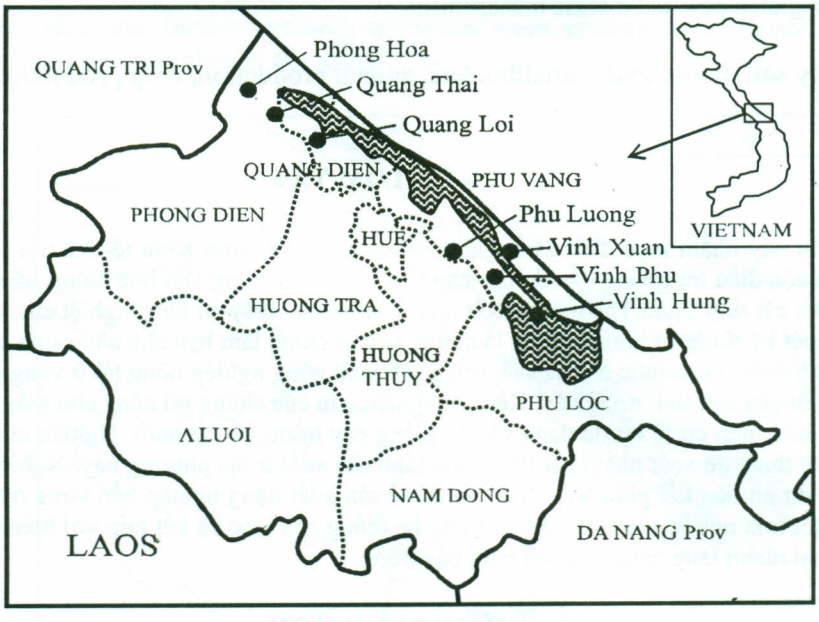

Figure 1. Map of Thua Thien Hue province, with boundaries of districts (names in capital) and location of the targeted villages (names in lower-case)

Data collection and analysis

Information was collected using a questionnaire for oral interview. This questionnaire covered various aspects of farming systems such as: family size, land and labor resources, crop and livestock production, organic matter utilization, etc. The education level of household's master was also surveyed as well as encountered pests and plant diseases. Income of households was estimated from animal and crop production, and from off-farm activities. Collected data were statistically analyzed using SPSS software (version 11.0).

RESULTS AND DISCUSSION

The main economic features of interviewed families are showed in Table 1. The family size averages 8.4 persons, often including 2 or 3, and sometimes 4, generations. On average, one family owns only 0.9 ha of farming land. But that area varies according to income level. The rich family has about 1.14 ha, while figures for average and poor families are 0.87 and 0.58 ha respectively. Large family and small farmland create a day-by-day increasing issue of population pressure on both each family and community as a whole. In addition to that, soil type and quality (Table 2) do not adequately support farmers for sufficient crop production. Indeed, in the field plots cultivated by the 145 interviewed farmers, i.e. some 500 plots, sandy soils (white or yellow sand) represent 80% of the land and, according to farmers' opinion, more than 40% are of bad or very bad quality. Farmers hardly expect high income from their crop and animal production. In the last decades, marginal arable land and high population pressure together resulted in splitting farmland from generation to generation, which caused many social problems and some farmers even became landless in this process.

Table 1. Mean values and coefficients of variation (CV) for different characteristics and income sources of the 145 surveyed farms in Thua Thien Hue province

Characteristics	Mean values	CV %
N° of persons per family	7.46	20
Farmland size per family (m^2)	9,012	27
N° of ruminants per farm (heads)	2.7	47
N° of pigs per farm (heads)	4.7	23
N° of poultry per farm (birds)	26.6	41
Total income per farm (millions VND/year)	14.9	46
Crop income per farm (millions VND/year)	6.2	40
Animal income per farm (millions VND/year)	5.6	31
Other income per farm (millions VND/year)	3.1	35

Table 2. Texture and quality of soils (percentage of cultivated land) as evaluated by farmers in Thua Thien Hue province

Soil texture			
White sand	Yellow sand	Medium texture	Clay
55.7%	26.5%	14.8%	3.0%
Soil quality			
Good	Medium	Bad	Very bad
4.4 %	52.9%	32.3%	10.4%

House is an important property of farmers in rural areas. Among the 145 visited households, we found that the type of houses shows marked differences between rich and poor farmers (Figure 2). There are about 5% poor households who have no house.

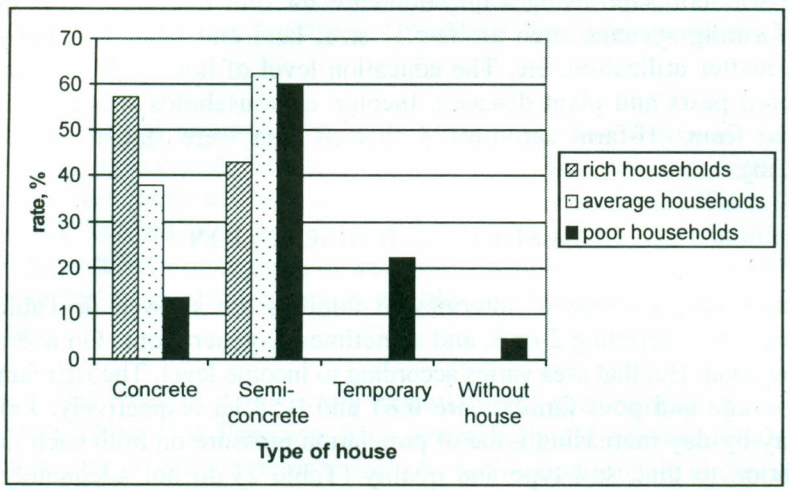

Figure 2. Characteristics of houses of 145 selected families in Thua Thien Hue province as a fonction of estimated income classe

Pests and plant diseases reported in Table 3 reflect another constraint on agricultural production in the surveyed area. All four main crops (rice, cassava, sweet potato, and groundnut) are affected by many different types of insects and diseases, which, according to local people, are very important and, unfortunately, highly widespread. This situation is likely related to optimal climate conditions for pathogens development, and to fragility of crops grown on poor soils as well.

As a consequence of these natural constraints, crop yield is generally low as compared to other areas of Vietnam (Table 3). For instance, rice yield (one or two crops per year) is only 4.3 tons per hectare and per year according to farmers' information, compared to some 10 tons per hectare and per year in the Red River and Mekong deltas. Consequently, self-sufficiency is not ensured in Thua Thien Hue province.

Table 3. Average yield, with standard deviation (SD), of main crops as reported by the 145 interviewed farmers in Thua Thien Hue province

Crops	Average yield ± SD (ton/ha/year)
Rice	4.30 ± 0.12
Cassava	11.36 ± 0.23
Sweet potato	2.67 ± 0.46
Groundnut	1.38 ± 0.03

Table 4. Major pests and plant diseases observed by farmers of Thua Thien Hue province and damages caused to main crops (+ + + : very widespread and very important; + + : widespread and important; + : locally important)

Scientific Name	English name	Local name	Distribution & damage level for plants			
			Rice	Cassava	Sweet potato	Groundnut
Major insects						
Cnaphalocrocismedinalis	Leaf folder	sau cuon la nho	+ + +	-	-	-
Scirpophaga incertulas W.	Yellow stem bore	Sau duc than 2 cham	+ +	-	-	-
Chilosupperessalis	-	5 vach dau nau	+	-	-	-
C. polychrysus	-	5 vach dau den	+	-	-	-
Spodoptera litura	-	sau keo	+	-	+ + +	-
Melanilis leda ismene	-	sau buom mat ran	+	-	-	-
Oxya sp.	-	chau chau lua	+	-	-	-
Nilaparvata lugens	-	ray nau	+ + +	-	-	+ + +
Nephotettix spp.	-	ray xan duoi den	++	-	-	-
Sogatella furcifera	-	ray lung trang	+	-	-	-
Leptocorisa oratorius	-	bo xit dai	++	-	-	-
Spodoptera litura	Taro caterpila	Sau khoang	-	+ + +	+ + +	+ + +
Agrotis ipsilon	Black cutworm	Sau xam	-	-	-	+ +
Helicoverga armigera	Cotton bollworm	Sau xanh	-	+ + +	+ + +	+ +
Lamprosema diemenalis	Soybean leaffolder	Sau cuon la	-	-	+ + +	+ + +
Heliothis spp.	Leaf-eating caterpillar	Sau rom	-	-	-	+ +
Aphis craccivora	Groundnut aphid	Rep muoi hai lac	-	-	-	+ + +
Epicauta gorhami M.	Blister beetle	Ban mieu	-	-	-	+ + +
Tetronichus bimacerlatus		Nhen do	-	+ + +	-	-
Cylas formicarius fabricius		Bo ha khoai lang			+++	
Omphisa anastomosalis		Duc la khoai lang			+++	
Major deseases						
Pyricularia oryzae	-	Dao on lua	+ +	-	-	-
Rhizoctonia solani K.	-	kho van	+ + +	-	-	-
Cercospora oryzae M.	-	Dom nau	+ + +	-	-	-
Grain discoloration	-		+ + +	-	-	-
Mycosphaerella arachidis	Early leaf spot	dom nau lac	-	-	-	+ + +
M. berkelevii	Later leaf spot	dom den lac	-	-	-	-
Aspergillus niger	Collar rot, seed rot	heo ru goc, thoi hat	-	-	-	+ + +
Puccinia arachidis	Rust	gi sat	-	-	-	+ + +
Peanut stripe virus	Groundnut stripe	la kham vang	-	-	-	+ + +
Ralstonia solanacearum	Bacteria wilt of potato	heo ru tai xanh	-	-	-	+ + +

In animal husbandry, it was found that the number of heads per ha of cultivated land is 4.1 pigs, 38.4 poultry and 4.4 ruminants. Breeds are mainly indigenous with high adaptability to local unfavorable climate and poor nutrition. They require less input compared to upgraded ones so that they are still preferred by farmers. The survey revealed high diversity in livestock species: 15 indigenous mammals and avian breed are raised in the region. The same situation was found for farmed vegetation, which consists

of more than 40 plant varieties. These diverse bio-resources offer a good foundation for future development of agriculture toward sustainable, profitable and ecological approach.

As in many traditional systems, farmers in this area try to exploit all organic products (Tables 5). Beside conventional agricultural byproducts such as straw and leftovers after crop harvest, some local people use other organic sources such as lagoon/seaweeds and hyacinth to improve soil fertility and to feed animals. Figure 3 presents the rate of organic manure utilization on different crops. However, a great number of interviewed farmers expressed their preference for using chemical fertilizers (urea and NPK fertilizers) instead of organic manure because they can bring immediate profits with respect to crop yield.

Table 5. Utilization of organic resources in the 145 surveyed farms (+ + + : widespread use; ++ : medium use; + : local use only)

	Organic resources						
Utilization	Rice straw	Groundnut stem & leaves	Sweet potato stem & leaves	Cassava leaves	Hyacinth	Lagoon seaweed	Animal waste
Burned on the field	+	-	-	-	-	-	-
Returned to soil	+++	++	++	++	+	++	++
Animal feed	+++	++	+++	+	-	+	
Fish feed	-	-	-	+	-	+	+
Litter	+++	+	+	-	-	-	-
Mushroom substrate	+	-	-	-	-	-	-
Family fuel	+++	++	+	+	-	-	-

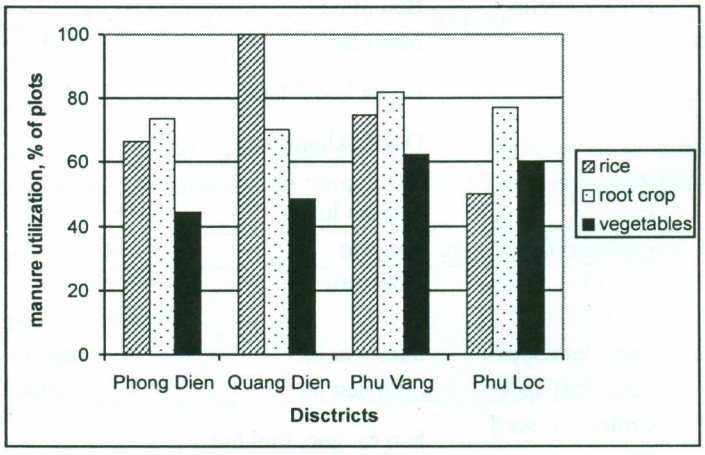

Figure 3. Rate of utilization of organic manure on different crops in the surveyed farms of the four coastal districts of Thua Thien Hue province

Table 6 shows the average yearly income from crop production and animal husbandry for the smallholders selected in the four disctricts. We calculated that the total output per hectare and per year ranges from 9.3 to 13.4 millions VND, which is very low as compared to 40 to 50 millions VND per hectare and per year in Habac, Hanoi or Thai Binh provinces. According to the data presented in Table 1, plant production, animal husbandry, and off-farm activities account for 41.5%, 37.6%, and 20.9% of mean total income. The variation of those proportions with family classes (rich, average, poor) is shown in Figure 4.

Table 6. Estimated annual revenue per hectare and per year from crop and animal productions in the selected farms of the 4 coastal districts of Thua Thien Hue province

District	Mean estimated revenue ± SD millions VND/ ha/ year		
	Crop production	Animal production	Total
Phong Dien	6.33 ± 0.29	7.06 ± 1.15	13.39 ± 0.72
Quang Dien	7.02 ± 0.61	5.88 ± 0.52	12.90 ± 0.56
Phu Vang	5.94 ± 1.76	4.40 ± 0.49	10.34 ± 1.12
Phu Loc	3.19 ± 0.63	6.08 ± 0.92	9.27 ± 0.77

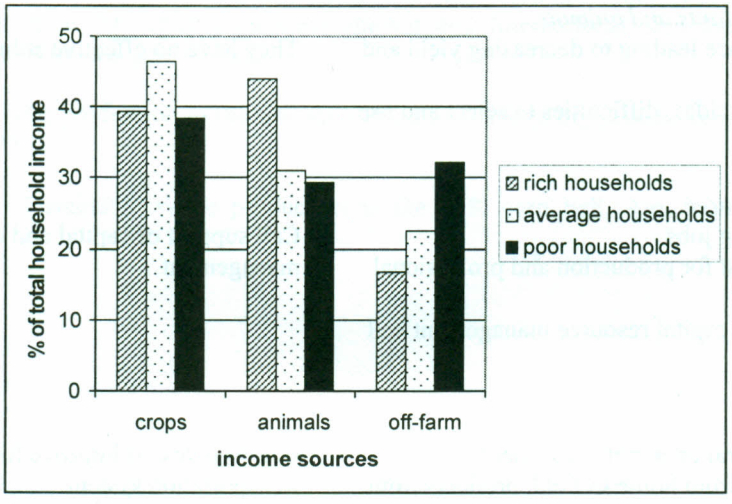

Figure 4. Relative income sources of the surveyed households in Thua Thien Hue province as a function of their estimated living standards

Farmers were asked to identify the constraints responsible for their fragile economic situation and to suggest possible solutions to alleviate these constraints (Table 7). Obviously, many factors contribute to poverty of family farmers, including natural limitations due to soils and climate, farming characteristics and socio-economic organization.

Table 7. Problems and constraints perceived by farmers and possible tracks for solution in their opinion

Problems and constraints	**Solutions suggested by local villagers**
Soil	
Poor condition sandy soil	They have no effective solution at moment
Lack water in dried season and flood in rain season	Call for support to solve problem
Water	
Lack of water in dry season and floods in rainy season	Call to invest in irrigation system
Irrigation not available, cropping mainly based on rainfall	Improve service quality of existing irrigation
Technique	
Lack of technical knowledge and experience for agriculture	Want attending practical courses on crop and
Scientific research not yet applied in agriculture	animal production
Not suitable use of chemicals	

Plant production	
High diversity of plant varieties but low yield and economic income	Want to have new plant varieties with high yield and better adaptation to sandy soil
Plant varieties are not pure and yield is not stable	Supply fruit plant with high economic value
Gardens with large area but low revenue	Ask for assistance in using organic manure and chemicals effectively
Animal production	
Small scale and low benefit	Want for training in animal husbandry
Lacking pure breed	Supply pure breed with high performance
Low nutritive value of food	
Poor housing condition	
Lack experience of husbandry and management	
Pests and diseases of plants and animals	
Very frequent occurrence leading to decreasing yield and quality of product	They have no effective solution
Too many kind of pesticides, difficulties to select and use them	
Labor and capital resource	
Labor in excess, lacking jobs	Call support of capital and education on management
Lack of capital to invest for production and professional education	
Lack of experience for capital resource management and use	
Transportation	
Poor road system in rural area, not convenient for transporting materials from home to field, products from field to home and to market	Call to invest to improve local road and transportation system
Market	
Low farm gate price	Ask for price control
Lack of price stability	Farm gate price not forced by middle-men
Social	
Population pressure	Improve life quality
Farmers leave villages to find job in city	Improve education condition and health care for women and children
Free immigration	

As a conclusion, our survey stresses on the need of an integrated approach to improve living standards of rural smallholders in Thua Thien Hue province and in Central Vietnam in general, as compared to other regions of Vietnam with more favorable natural and socio-economic conditions. Scientific, technical, social and economic research involving all aspects of farming systems (soil-plant-animal-human interactions) and wider environment is a great challenge for researchers and public authorities.

IMPLEMENTING

To improve soil fertility and food production, in sandy area, the locally available organic resource should be employed and appropriately used in system VAC (Garden, fish-pond and Animal husbandry). Some new varieties of cassava, groundnut can be introduced to increase yields of root plants.

Net garden system can be applied to reduce temperature and water evaporation as well as prevent the damge of pest and insect for vegetable production to improve income for farmers in this area.

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